

# Statistical Methods II

## Quiz 02

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Welcome to the second quiz. I designed this quiz for you to see what information I need to explain again and to give you some practice for the first examination (February 24, 2011). You have five (5) minutes to answer these 10 questions. The total number of points is 10.

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### Distribution Review

1 (1 point)

Let us suppose  $X \sim \mathcal{N}(\mu = 1, \sigma^2 = 3)$ ,  $Y \sim \mathcal{N}(\mu = 3, \sigma^2 = 2)$ . What is the distribution of  $X + Y$ ?

### Hypothesis Testing for two samples

Let  $x_1, x_2, \dots, x_m$  be a sample from  $X \sim \mathcal{N}(\mu_X, \sigma_X^2)$  and  $y_1, y_2, \dots, y_n$  be a sample from  $Y \sim \mathcal{N}(\mu_Y, \sigma_Y^2)$ . In other words, the  $x$ 's and the  $y$ 's are samples from two populations that are Normally distributed, but we do not know the respective population means or population variances.

2 (1 point)

From the information given, what test should we use to compare the two means? A t-test or a Mann-Whitney test? Explain.

3 (1 point)

From the information given, what test do we use to determine if the two variances are not equal,  $\sigma_X^2 \neq \sigma_Y^2$ ? Give the name of the test or the R function.

### Hypothesis Testing for three samples

Let  $x_1, x_2, \dots, x_m$  be a sample from  $X$ ,  $y_1, y_2, \dots, y_n$  be a sample from  $Y$ , and  $z_1, z_2, \dots, z_n$  be a sample from  $Z$ . In other words, the  $x$ 's,  $y$ 's, and  $z$ 's are samples from three populations, where we do not know their distribution nor do we know their respective population means or population variances.

4 (1 point)

We would like to use ANOVA to test the equality of means. Give one reason why we do not want to perform 3 separate t-tests.

5 (1 point)

To use ANOVA, there are three assumptions that need to be checked. The first is independence. This is (for now) checked using logic of the experiment. What is a second? What do we do to test that assumption?

6 (1 point)

What is the third, and what do we do to test that assumption?

### True and False

Please write 'TRUE' in the space provided if the statement is true; 'FALSE', if the statement is not true.

7 (1 point)

The sum of seven independent Normal distributions is a Normal distribution.

7. \_\_\_\_\_

### R Questions

What do the following commands do? Make sure you make it clear that you know what the function and its given parameters do.

8 (1 point)

```
wilcox.test(var1, var2)
```

9 (1 point)

```
shapiro.test(var1)
```

### R Questions

I tested the IQ of three groups of patients. Group 1 consisted of patients who were not Autistic. Group 2 consisted of patients who were mildly Autistic. Group 3 consisted of patients who were severely Autistic. My research hypothesis was that IQ and Autism are not statistically related. To do this, I thought I should use an Analysis of Variance procedure. During the analysis, I typed in `bartlett.test(IQ Group, data=Autism)`. The following was the output.

```
Bartlett test of homogeneity of variances
```

```
data: IQ by Group
```

```
Bartlett's K-squared = 1.8195, df = 2, p-value = 0.4026
```

10 (1 point)

What is the conclusion of this test?